



# New Hampshire Evaluation Monitoring Project

Using Forest Health Monitoring Indicators To Assess Residual Stand Decline  
Discovered Through Statewide Aerial Survey Program

by  
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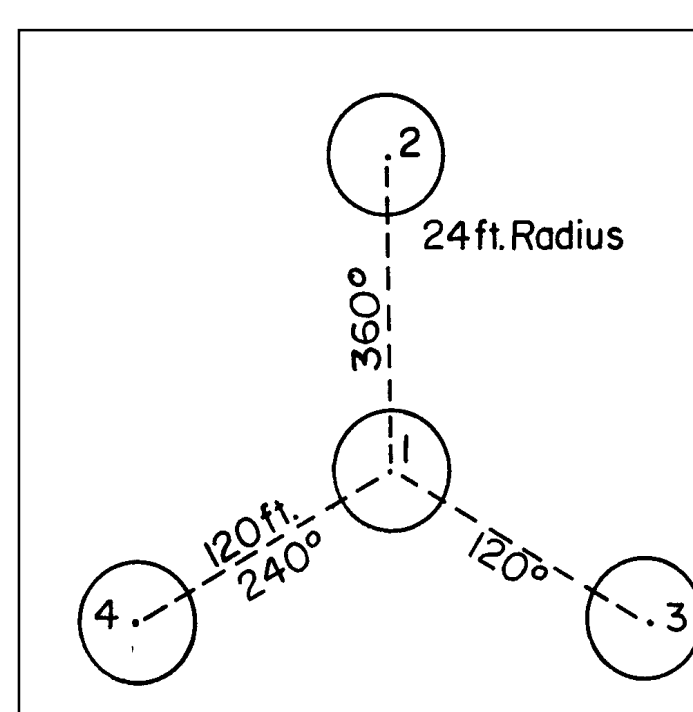
## INTRODUCTION

New Hampshire's Division of Forests and Lands has conducted statewide, annual aerial sketch-mapping surveys for the past thirty years. Over this period the Division has identified and mapped millions of acres of damage caused by dozens of forest pests and forest health stressors. During recent years, when widespread insect damage has been low, crown dieback and decline in some recent timber harvested areas became one of the more noticeable damages on the landscape. With the acreage of residual stand decline (RSD) on the increase, or at least more noticeable from the air, we felt it necessary to implement a ground based evaluation project to document any forest health decline and make a preliminary determination of causal agents.

## PLOT ESTABLISHMENT

Aerial sketch-maps from the 1998 and 1999 survey season were inventoried for damage polygons labeled "RSD-hardwoods". Each polygon was visited on the ground to evaluate suitability for this study. Study sites had to be harvested within a period of five to ten years ago. Eight sites met that criteria. Four control sites (timber sales with the same age and species composition criteria) were also selected

in the same general region of New Hampshire.



Plot layout duplicates the four point cluster of the FHM program. Within each 24th acre subplot all trees over 5" dbh were measured for mensuration data, crown data, and soil compaction data in the same manner as the FHM program.



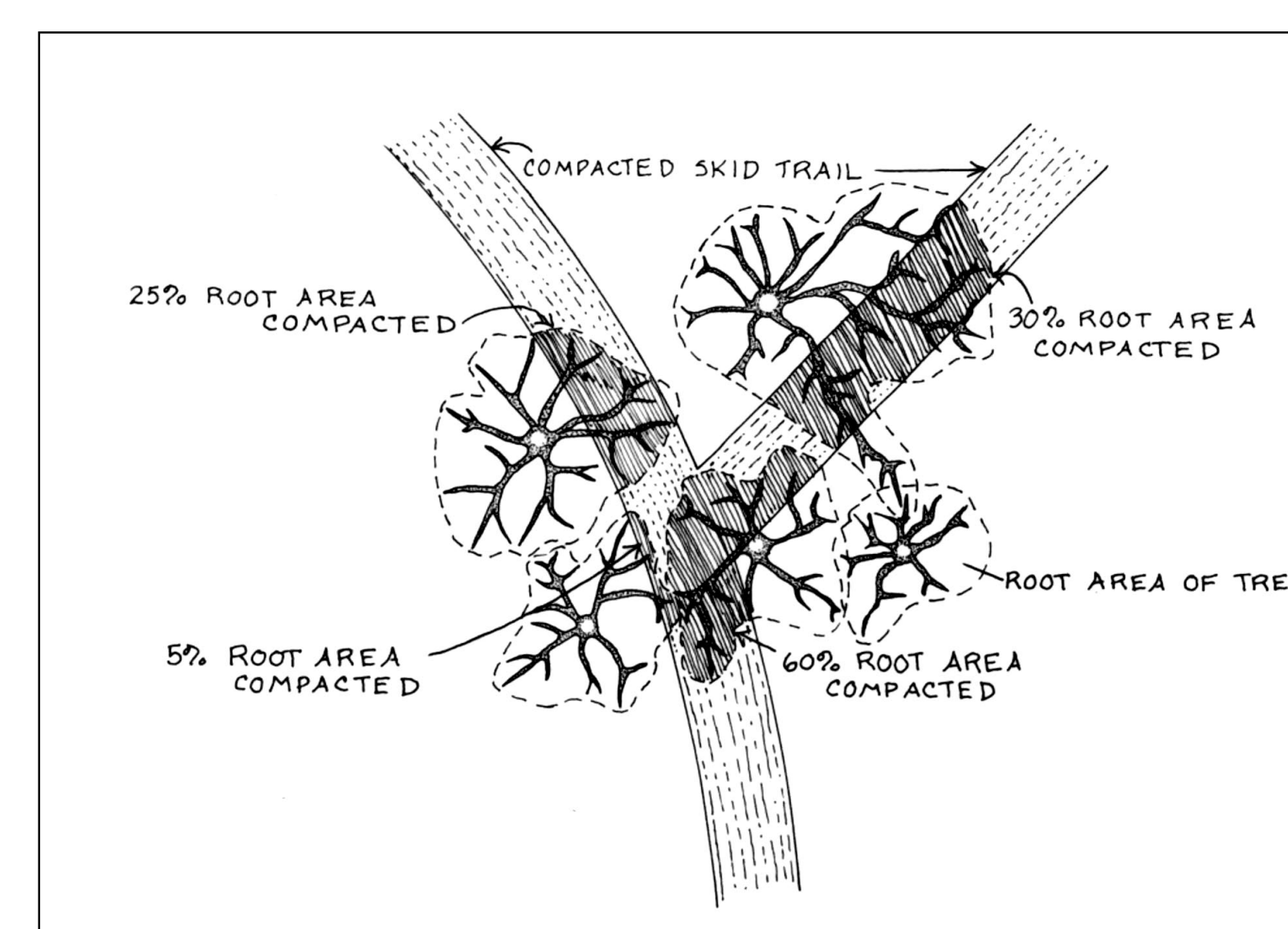
Figure 1. Photo taken during sketchmapping mission shows discolored and declining trees within timber sale area.



Figure 2. Sugar maple with logging damage to the roots and lower bole. 40% of the root area was compacted.



Figure 3. Declining hardwoods in 5 yr. old timber sale.

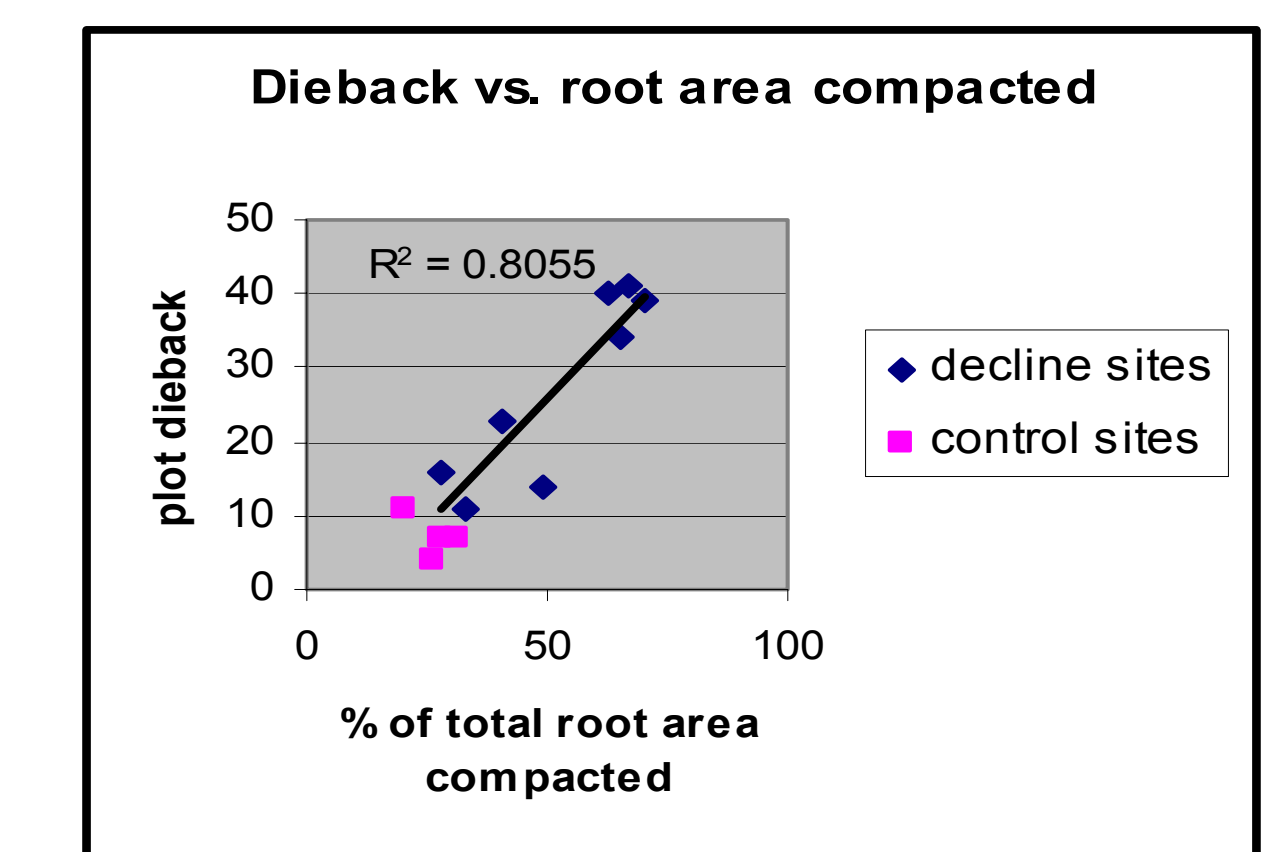
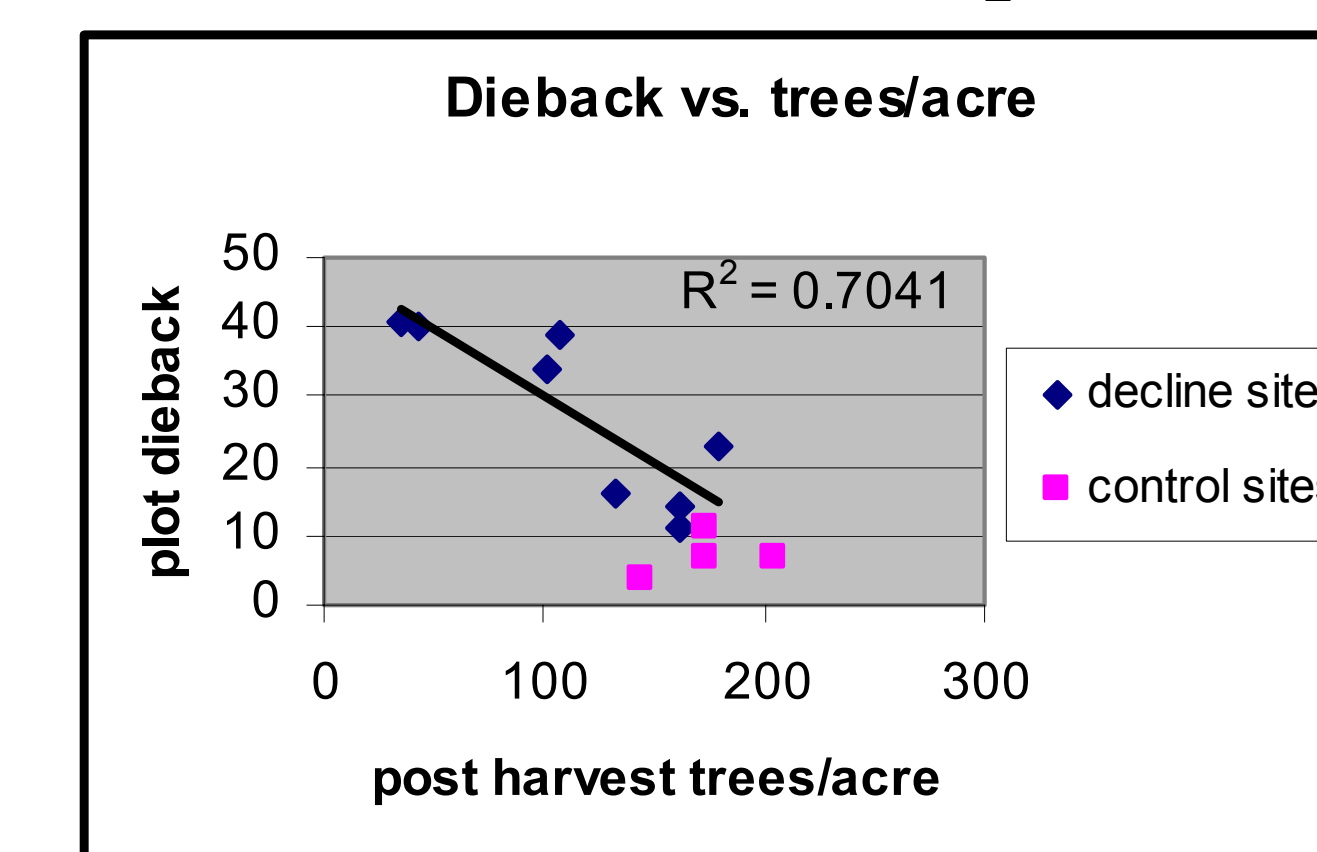


This diagram depicts the method by which root area compaction was evaluated. Within each subplot, all trees over 5" were examined. The drip edge of the crown was used as the outer limit of root area. Evidence of compaction was coded as a percent of the total root area.

## RESULTS

Analysis of FHM data from the northeast region of the U.S over the past ten years suggests a healthy forest maintains an overall tree dieback rating of 0-5%. Currently, New Hampshire maintains a statewide mean of 4.1% crown dieback for all hardwoods. The mean crown dieback within the study area, including control sites, ranged from 4 to 41%. All decline sites combined averaged 27% dieback, while the control sites averaged 7% dieback.

Elevation, aspect, understory vegetation, and tree diameter showed no correlation to increases in crown dieback. Tree species and amount of logging injury showed a slight correlation to increases in dieback. As shown in the following graphs, the two indicators that expressed the highest correlation to increases in crown dieback are residual trees per acre and amount of root compaction.



## CONCLUSIONS

As crown dieback increases, the photosynthetic ability of the tree decreases. With this change comes a decrease in tree vigor. If the decline in vigor occurs uniformly throughout a particular stand, overall forest health and productivity suffers. A strong relationship was shown between the total area of root compaction incurred during logging and the subsequent amount of tree dieback. The northern hardwood sites with the highest risk of tree dieback following a timber harvest are **lightly stocked residual stands on west slopes, with over 40% of the residual stands root area compacted by heavy equipment**. In addition to root compaction, leaving fewer than 125 trees per acre, and damaging more than 25% of the residual stems with mechanical wounds, set forest health into serious decline on these sites. Forest soil types and hydrology, while not studied in this project, play an important role in the tree response to heavy logging stress. The data from this study supports the assumption that the amount of dieback is sensitive to, and dependent on many factors, both biological and mechanical. For this reason it is important to measure and monitor tree dieback before and after forest management operations.